

TRANSFORMATIONS

Parabola

$$\frac{\text{General Equation}}{f(x) = \pm a(x-h)^2 + k}$$

Square Root

$$f(x) = \pm a\sqrt{x-h}$$

absolute
value

$$f(x) = \pm a|x-h| + k$$

Semicircle

$$f(x) = \pm a\sqrt{1 - \left(\frac{x-h}{c}\right)^2} + k$$

Vertical Shift

K will move your graph \uparrow or \downarrow

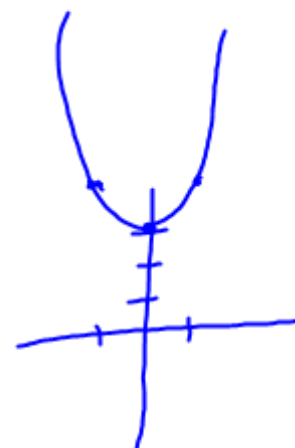
ex) parabola

$$y = x^2$$



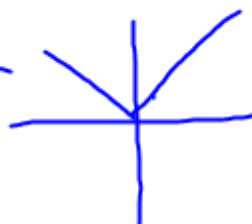
$$y = x^2 + 3$$

x	y
0	3
1	4
-1	4



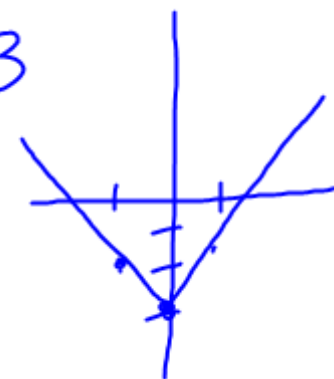
ex) absolute value

$$y = |x| + K$$



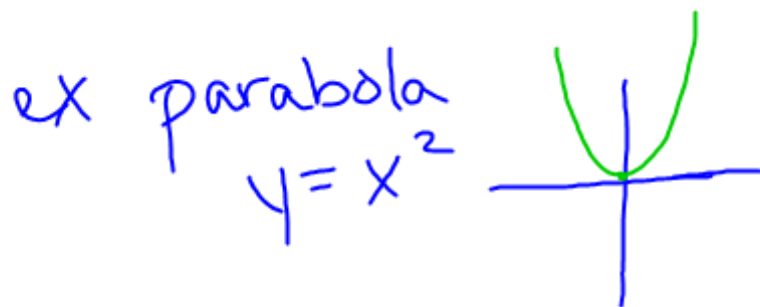
$$y = |x| - 3$$

x	y
0	-3
1	-2
-1	-2



Horizontal Shift

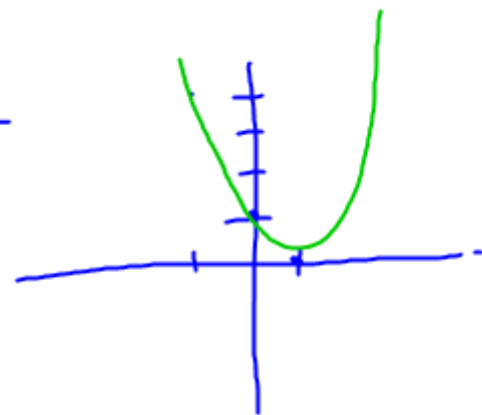
h moves your graph left or right



$$y = (x - 1)^2$$

↓

x	y
0	1
-1	4
1	0

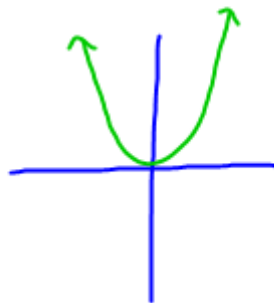


* notice we put a $+1$ in the general equation & it moves it \rightarrow but in this equation it reads as -1

Horizontal Cont.

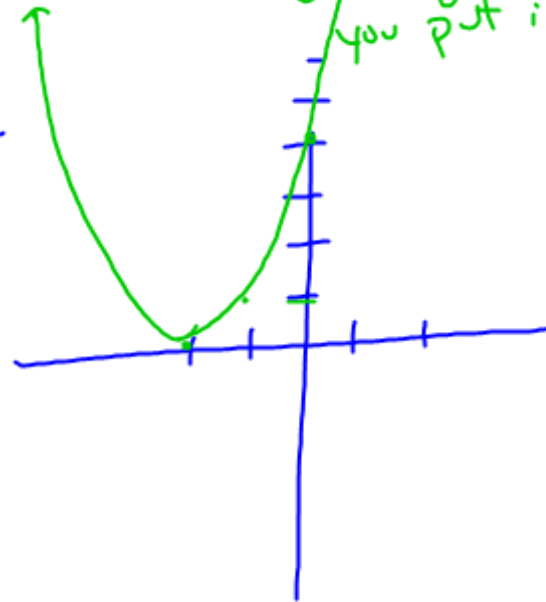
ex parabola

$$y = x^2$$



$$y = (x+2)^2$$

x	y
0	4
-1	1
-2	0
-3	1



general form

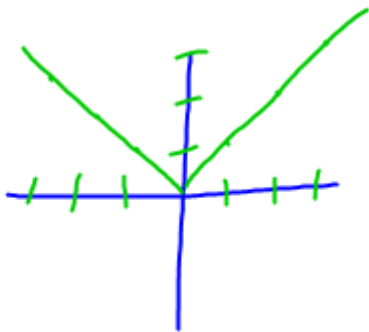
$$y = (x-h)^2$$

so to get $(x+2)^2$
you put in a -2

Stretch & Reflect

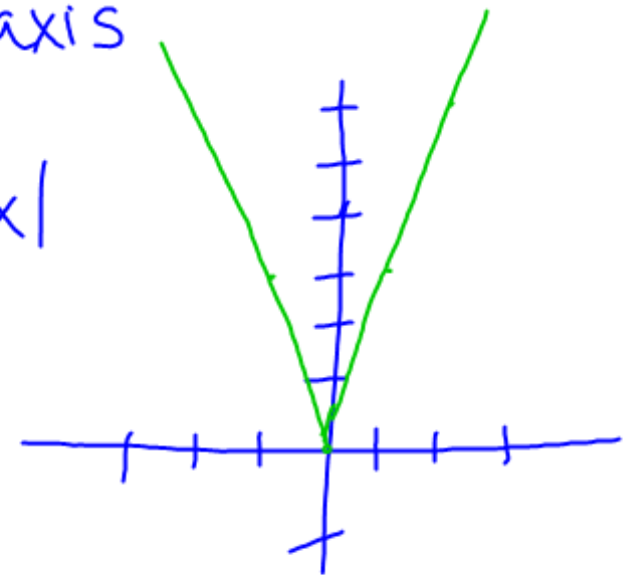
a will compress & stretch your graph
and changing the sign will reflect
the graph over the x-axis

ex $y = |x|$



ex) $y = 3|x|$

x	y
0	0
1	3
-1	3
2	6



* becomes steeper

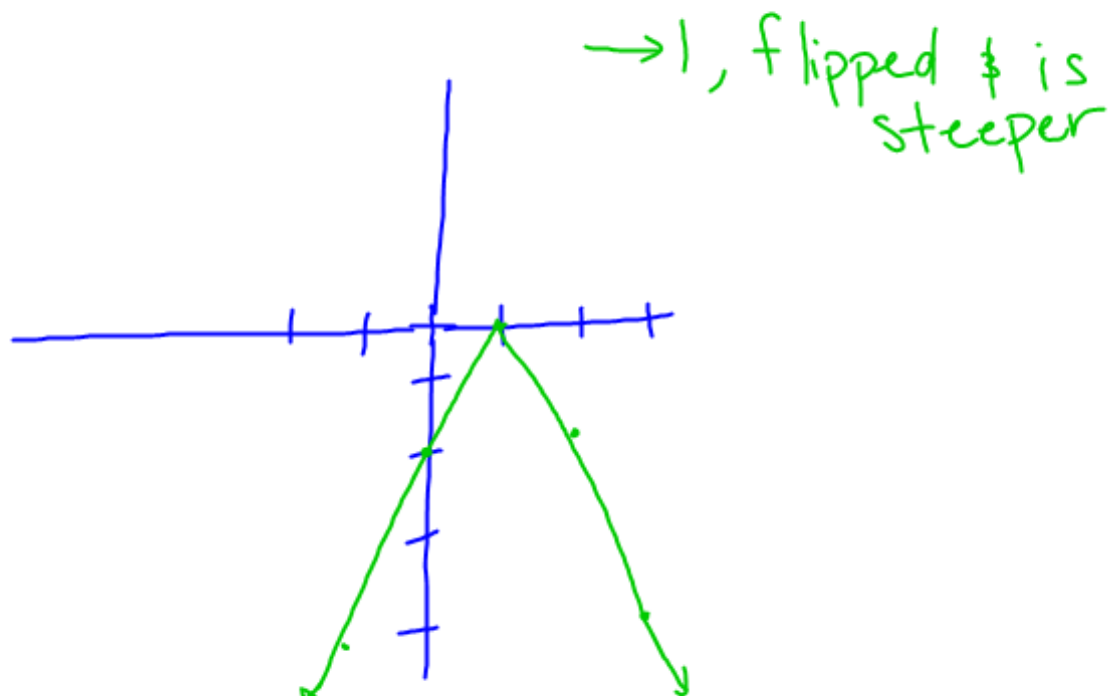
Stretch & Reflect cont

ex

$$y = -2|x-1|$$

↑ ↑ ↑

x	y
3	-4
2	-2
1	0
0	-2
-1	-4

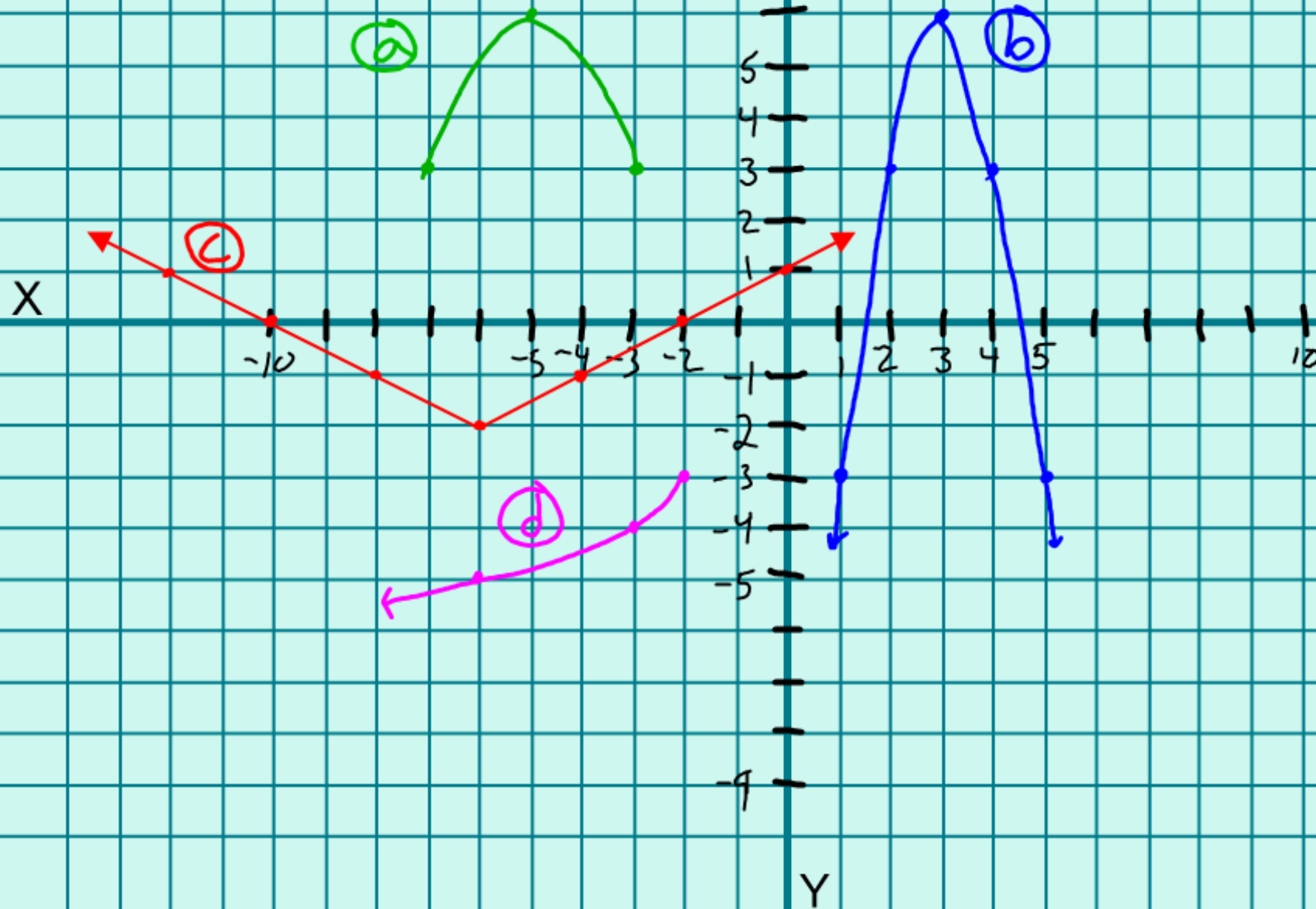


Practice Problems

- 1) Given a parabola with a vertex at $(3, -5)$ and passing through points $(4, -3)$ & $(2, -3)$, write the equation of a quadratic.
- 2 Find the equation of each graph described
 - A) a square root function that extends left starting at $(3, 1)$ & passing through the point $(2, 2)$
 - B) A semi-circle with endpoints at $(-1, -2)$ & $(-5, -2)$ & a top at $(-3, 3)$
 - C) an absolute value function opening downwards with a vertex at $(2, 1)$ and passing through $(0, 0)$ & $(4, 0)$

③ Find the equation for each function.

④ Give the domain and range for each function



⑤ Describe the transformations indicated by each function and sketch a graph without a calculator.

① $f(x) = -2(x+1)^2 - 3$

② $f(x) = \frac{1}{2}\sqrt{3-x} + 4$

③ $f(x) = \sqrt{1 - \left(\frac{x+2}{4}\right)^2} + 1$

④ $-2f(x-3)+2$, no graph needed.